UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

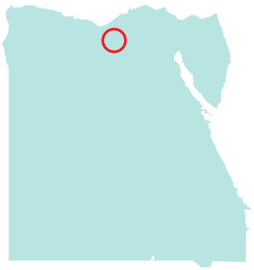
Industrial Energy Efficiency Project
Compressed Air System Optimization

Typically over 75% of the lifetime costs of compressed air system are energy related. This case reviews the optimisation of compressed air system at Beshay Steel Company in order to address the potential energy consumption savings. This study reveals compressed air system opportunities assessed in this plant with potential savings 3,271,495 kWh (or EGP 2,106,160) per annum at an investment cost of EGP 814,215.

EGYPT

A Case Study of Beshay Steel Company

Beshay Steel Snapshot



Industry: Steel Industries
Location: Sadat City, Menoufia, Egypt
Product: Billets, Re-bars and wire rods
Implementation cost: 814,215 EGP
System: Air Compressors
Annual energy savings: ~3,271 MWh
Financial savings: ~2.1 million EGP /year
GHG reduction: ~1,185 tCO_2eq (10 y)
Overall payback: 3 months

Beshay Steel group is one of the largest steel producers in Egypt and the Middle East established in 1960s. The company now is capable of producing over 2 MTPY of steel long products, re-bars, wire rods and merchant bars. The majority of the production meets the demands of the local market and the balance is exported. The group is divided to 3 parts; International steel rolling Mill (ISRM), Egyptian American Steel Rolling Co. (EASROC) and Egyptian Sponge Iron Steel Co. (ESISCO)

CASO at Beshay Steel and the IEE Project

The Industrial Energy Efficiency Project (IEE) is a programme developed and initiated by UNIDO to promote energy efficiency in industry as part of its primary objective "promoting and accelerating inclusive and sustainable industrial development in developing countries and economies in transition."
The Compressed Air Systems Optimisation (CASO) Project forms part of the IEE Project and has the specific objectives of developing local personnel to become competent in the application of energy efficiency in industry in order to unlock the potential for energy savings within their respective local industries.
As leading steel manufacturing company, Beshay is committed to implement and continually improve an effective and transparent energy management system in its entire energy intense works for the good of our nation and our community. It needs to reduce operating costs to remain competitive in the global market.
There are some developed saving opportunities for the company to reduce energy consumption, consider energy performance improvements, comply with the national environmental and legal requirements and focus on employees' awareness and capacity building. Since compressors consume a large proportion of electrical energy, Beshay has focussed on compressed air consumption improvements.

Summary of Optimization Strategies

Saving Opportunity	Energy Savings (kWh/year)	Financial Savings (EGP)	Capital Cost (EGP)	Payback (Year)
Fixing Drain Valves	112,945	77,180	10,680	0.14
Inappropriate Use (Bearing Cooling)	673,640	455,380	10,000	< month
Inappropriate Use (Air Curtain)	430,990	291,350	6,000	< month
Inappropriate Use (Stands of Rod Milling)	655,945	443,420	9,000	< month
Pressure Drop at Peak Demand	5,705	3,860	---	0.0
Pressure Drop between Wet and Dry Tanks	296,845	200,665	55,535	0.28
Variable Speed Air Compressor	645,425	436,305	623,000	1.43
Install inverter for cooling system	450,000	198,000	100,000	0.5
Total:	3,271,495	2,106,160	814,215	0.3

Case Description

The Compressed Air system at Beshay consists of 8 air compressors 56 kW per each and 2 air compressors 75 kW per each. There are 5 air dryers with rated capacity 600 CFM per each, 4 wet tanks 3.3 m3 per each and 2 dry tanks 5.4 m3 per each. Successful implementation could realize energy savings but also serve as a stepping stone to realize more energy savings in other areas of production.

The 3 major CASO (Inappropriate use of Bearing cooling, Air Curtain and Stands of rod milling) savings represents 54.6 % of the total compressed air consumed by the company. They were identified as significant energy users consuming 20.87%, 13.36% and 20.33% of the utilities plant compressed air consumption respectively.

The assessment involved reviewing process requirements, reviewing historical data, taking system measurements and developing optimisation solutions. This approach requires the engineers to develop a strong understanding of the system efficiency, operation and control conditions, as well as maintenance practices impact.

Optimization Strategies

IEEP helped Beshay Steel group is addressing the potential energy measures in the compressed air and based on the measured data, some valuable energy saving opportunities were assessed

Four possible opportunities for energy saving in compressed air demand system were identified. Three of them involved eliminate improper compressed air use (through Bearing cooling, Air Curtain and Stands of rod milling) and the fourth one involved reducing compressed air losses through the drain valves (and leaks). Two possible opportunities for energy saving in compressed air distribution system were identified involved decreasing the pressure drop (in network pipe and between the wet and dry tanks).

One possible opportunity for energy saving in compressed air supply system was identified involved Installing VSD Air Compressor to eliminate load/unload mode that leads to reduce the overall the system energy consumption.

Outcome and Lessons Learnt

For the air compressor system, it was recommended to implement the demand and distribution options first to reduce the energy consumption in the compressed air system with total savings amount of 3,271,495 kWh (or EGP 2,106,160) per annum at an investment cost of EGP 814,215.

Applying a structured approach to CASO can often realise with no or low cost requirements. This case only realises 67.4% of total compressed air consumption. Beshay now realize the potential savings as it has other air compressor consumption systems at the plant that could also be epitomized. Using a continuous improvement approach it intends to realize these savings in future projects.

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